INVESTIGATION OF ALLEGED WATER SUPPLY INTERFERENCE BY THE GLENCOE MUNICIPAL WELL NO. 8

August, 1976

Ontario

Ministry of the Environment

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Director
Southwestern Region

THE ONTARIO MINISTRY OF THE ENVIRONMENT
SOUTHWESTERN REGION
Technical Support Section

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by

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August, 1976
LONDON

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SUMMARY

Field investigation, examination and analyses of available geologic and hydrologic information indicated that there are three distinctive hydrostratigraphic units in the study area: (a) lacustrine clay and glacial till, (b) lenses and lenticular-shaped deposits of sand and gravel of limited extent, and (c) shale and minor limestone which belong to the Hamilton Group of Formations of Paleozoic age. The first and third hydrostratigraphic units are considered to be aquitards, whereas the buried sand and gravel deposits are considered to constitute an aquifer.

The production wells which comprise the Hadler well field are obtaining water from the buried sand and gravel aquifer at depths between 110 and 120 feet. Spacing between these wells is inadequate so that mutual interference between them does exist. The limited extent of the buried sand and gravel aquifer, and slow groundwater recharge which has been exceeded by pumpage have contributed to the severe decline of the artesian pressure of this confined aquifer system. Precipitation is the main source of groundwater recharge in this area which occurs in the form of vertical leakage through confining deposits.

The radius of influence created by the year-long operation of the Glencoe municipal well No. 8 is relatively confined around its pumping center. Water well No. 777, which taps the buried sand and gravel aquifer at approximately the same depth as the Hadler wells and the municipal well No. 8 is located closer to the Hadler well field. An automatic water level recorder was installed in this well in August, 1975 and until the end of that year, interference from municipal well No. 8 was not indicated. On the other hand, erratic behavior of the water level in well No. 777 which occurred in September 1975 is attributed to the surface water intake into this well.

On the basis of this investigation it is unlikely that the Hadler well field has been interfered with by the operation of the Glencoe municipal well No. 8.

INTRODUCTION

Background

Mr. E. Hadler operates a large turkey farm on lots 22 and 23, 1st Range South, Township of Ekfrid, Middlesex County. In January, 1974 he expressed concern about potential interference with his water supply which might be caused by the forthcoming operation of the Glencoe municipal well No. 8. Mr. Hadler's concern was raised through his lawyer who wrote a letter to the Ministry of the Environment (MOE) on January 3, 1974 on his behalf.

Information at the time of the initial complaint was insufficient to determine whether or not the operation of the municipal well would have any serious effect on Mr. E. Hadler's water supply. Accordingly, an automatic water level recorder was installed on one of Mr. Hadler's wells on April 18, 1974 (well No. 774). Monitoring of other wells in the area was undertaken both prior to and after the start of the Glencoe municipal well No. 8 pumpage. These data would provide the basis for determining the extent, if any, that water level interference was attributable to municipal groundwater withdrawals.

An investigation into Mr. E. Hadler's concern has been carried out by staff of the Technical Support Section.

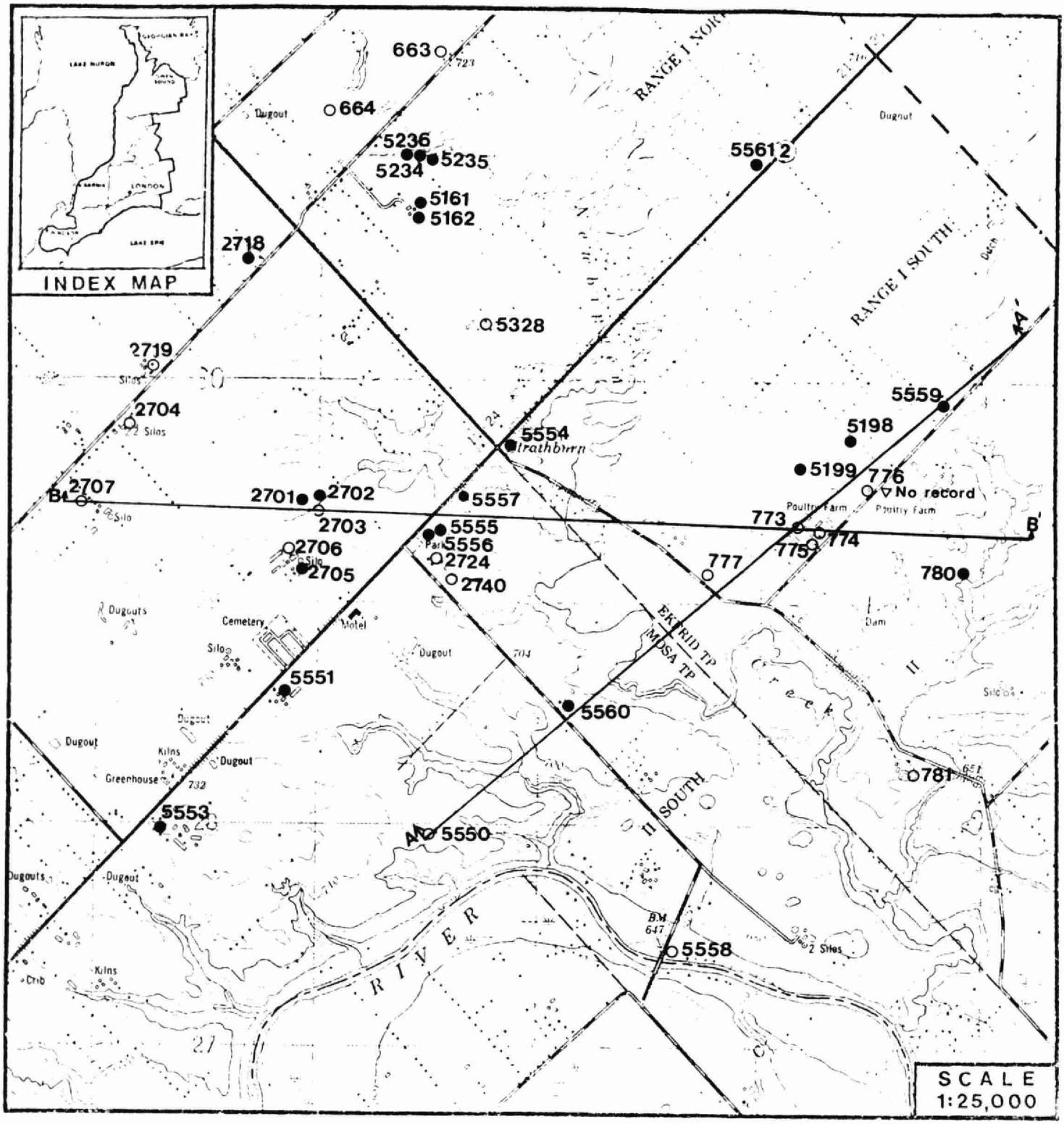
Location

The area under study is located about 33 miles southwest of London in Ekfrid Township, Middlesex County, (Figure 1).

Figure 1 shows the location of local water wells in a broader area for which records are on file with the Ministry of the Environment. Indicated well numbers are those adopted by MOE and they will be referred to throughout this discussion. Figure 1 also shows locations of cross-sections and instrumentations installed during the course of this investigation.

Field Investigation

Subsequent to the water well interference complaint received from Mr. E. Hadler in the middle of June 1975, an investigation was carried out in order to assess hydrogeological characteristics of the area. Water well records served as a base for this investigation. In the field, depths to water levels in Mr. E. Hadler's wells, and other neighbouring wells were measured. Since then, water levels in these wells have been measured periodically. Groundwater withdrawals, and depths to water level in Glencoe municipal well No. 8, continued to be measured on a daily basis. Pumping rate in this well was reduced from 18-20 to about 14-16 Igpm.



LEGEND

o, ●, 775	Overburden and bedrock well with MOE well number
5557	Glencoe municipal well No.8.
775; 776;5198	The Hadler production wells (October, 1975)
777 and 774	Wells equipped with automatic water level recorder (October, 1975)
A ——— A'	Location of geological cross section

FIGURE 1. LOCATION MAP.

On August 8, 1975 an automatic water level recorder was installed in well No. 777 located between Glencoe municipal well No. 8 and the Hadler Turkey Farm Inc., well field. Most of the field data were collected by Mr. B. Jaffray of this office.

Development of the Well Field of the Hadler Turkey Farm Incorporated

The operation of this farm started in 1963. Since then, as the operation was expanding, several wells were drilled on the property in search of additional sources of water.

During our first field inspection in June 1975 there were between 110,000 and 115,000 turkeys on the farm. Assuming an average water consumption of 15 gallons per 100 head per day during the summer months, the total water use for the whole farm was between 16,500 and 17,250 Igpd. This required an average continuous pumping rate of 11.7 Igpm.

There are seven water well records for wells drilled on the Hadler property. Four wells are equipped with submersible pumps and three were in production during the summer of 1975 (Well Nos. 775, 776, and 5198, Figure 1). The fourth well, for which there is no log, has a pump, but it is disconnected from the hydro. This well has not been in operation for at least a year. Water storage is

not available so that water from production wells is pumped directly into the distribution system.

Three other wells drilled on this property (well Nos. 773, 780 and 5199) proved to have insufficient yields to become production wells and they were abandoned after the completion of drilling. Well No. 774 has been equipped with an automatic water level recorder since April 18, 1974. Unfortunately data collected from this recorder have proven to be of little use for this investigation, because of severe interference from Hadler's production well(s) and direct access of surface water into this well. Erratic traces on the recorder charts, due to the complainant's shifting the instrument (to gain access to the well pit), have added to the difficulties in gaining a meaningful interpretation from the hydrograph records.

Operation of the Glencoe Municipal Well No. 8

Glencoe municipal well No. 8 was constructed and put into production as the result of a groundwater exploration program carried out by the OWRC in the summer of 1971. As a part of this program, 13 test holes were drilled throughout the area located about 3 miles south and southeast of the Village of Glencoe (Morrison, 1971).

Well No. 8 was put into production in December, 1974 with an initial pumping rate of about 18 to 20 Igpm. Since then, the pumping rate was maintained relatively steady until June of 1975, when it was reduced to about 14 to 16 Igpm.

The depth to the original static water level in this well was 25 feet below ground surface. Since June of 1975 the water level in this well appears to have stabilized with the exception of October, 1975 when a slightly declining trend prevailed, which may have been caused by (a) reduced recharge, (b) increased pumping rate, or both.

HYDROGEOLOGY OF THE AREA

General Hydrogeology

According to Chapman and Putman (1966), this area is part of the Ekfrid Clay Plain physiographic unit.

The hydrogeology of the area is delineated by two cross sections shown in Figures 2 and 3. They are based solely on information from water well records. It can be seen from these two cross sections that the water-bearing zone consists of gravel and sand lenses with limited lateral extent and thickness. The thickness of sand and gravel deposits at the Hadler well field does not exceed 10 feet,

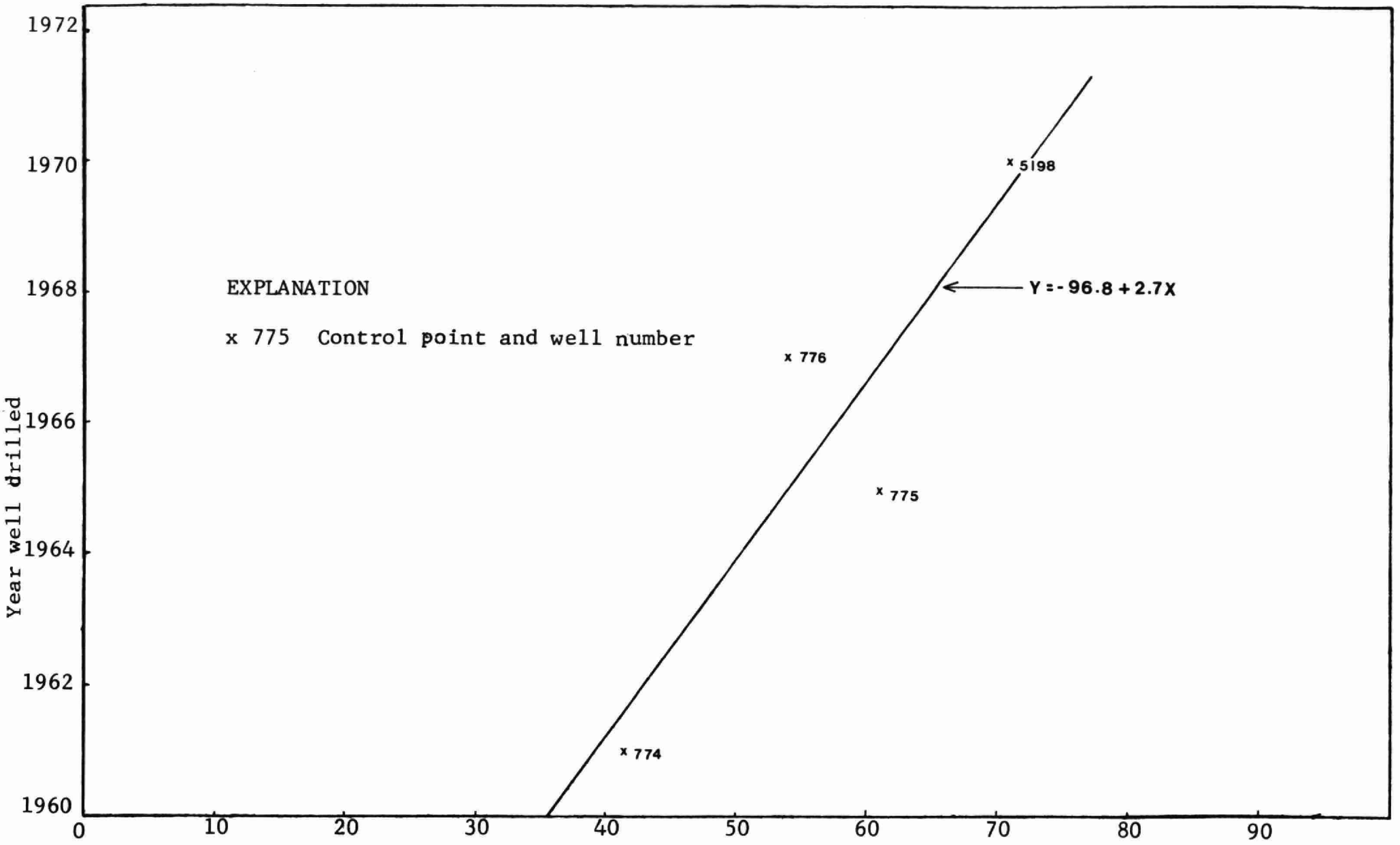


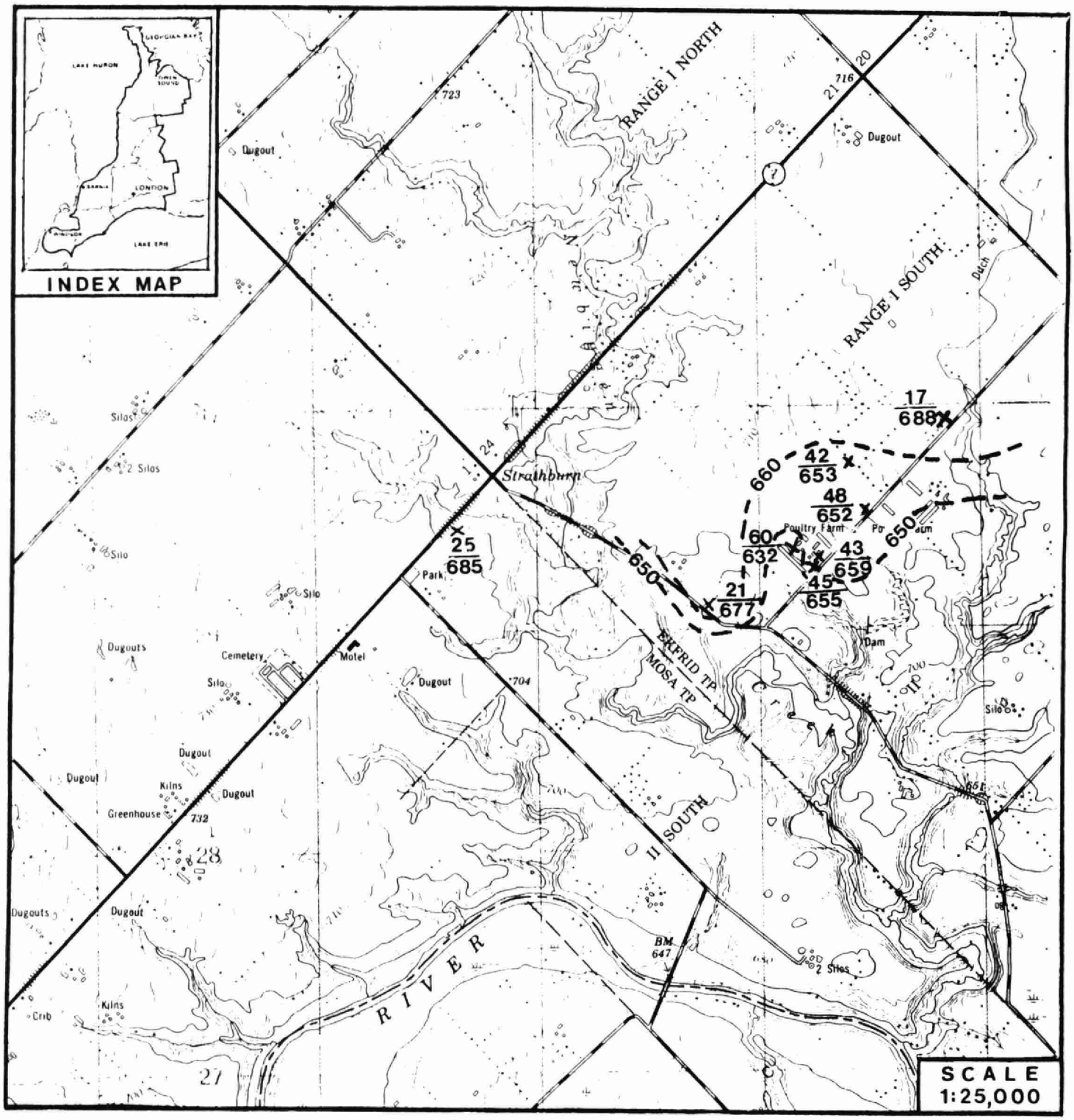
FIGURE 4. SCATTER DIAGRAM OF DEPTH TO WATER LEVEL AND YEAR WELL DRILLED.

while at the municipal well No. 8 gravel and sand deposits had a reported thickness of about 30 feet. This sand and gravel aquifer material is overlain by 110-120 feet of lacustrine clay and hardpan (Figure 2 and 3) which is considered to be an aquitard. The sand and gravel deposits are situated immediately above, or near the bedrock surface.

Decline of Artesian Pressure of the Buried Sand and Gravel Aquifer System

Although there is no direct evidence that the sand and gravel deposits encountered in the Hadler wells are continuous throughout the area there is a strong indication that these lenticular-shaped deposits are hydraulically connected. Further discussion will support this.

A plot of the depths to static water level in the Hadler wells versus the year when the well was drilled, produces a linear correlation (Figure 4). Although, there are only four control points, it suggests that as the groundwater withdrawals increased, the drawdowns also increased with the result that the cone of depression was becoming wider, gaining its "regional" character. Thus, lowering of water level over a larger area and mining of the buried sand and gravel aquifer system became apparent. Mining occurred because groundwater pumpage exceeded natural



LEGEND

42 / 653 ← Depth to reconstructed original static water level, in feet; Elevation of static water level, in feet

---660--- Line of equal hydraulic head, in feet

FIGURE 5. RECONSTRUCTED DEPTH TO THE "ORIGINAL" STATIC WATER LEVEL AND PIEZOMETRIC SURFACE OF THE BURIED SAND AND GRAVEL AQUIFER SYSTEM AT THE HADLER TURKEY FARM INC., WELL FIELD.

recharge to the aquifer. As a result of this, during the high water demand in the summer months, pumps broke suction frequently.

Present Water Level in the Buried Sand and Gravel Aquifer Systems

An attempt has been made to reconstruct the shape of the original piezometric surface of this aquifer system (Figure 5). It shows that the hydraulic gradient of this aquifer was toward Newbiggen Creek which is the area of natural groundwater discharge.

Measurements in the Hadler production wells during the summer of 1975 revealed water levels between 90 and 105 feet. This depends on how long the pump was in operation before the measurement was taken (Figure 6). Nevertheless, it indicates a sharp decline of the original piezometric surface of the buried sand and gravel aquifer system and the widespread nature of the composite cone of depression (Figure 7). Severe mining of the aquifer is taking place.

The water level in Glencoe municipal well No. 8 remained relatively constant during the summer and fall of 1975 (Figure 6) with the exception of the month of October, when a gentle and gradual water level decline occurred.

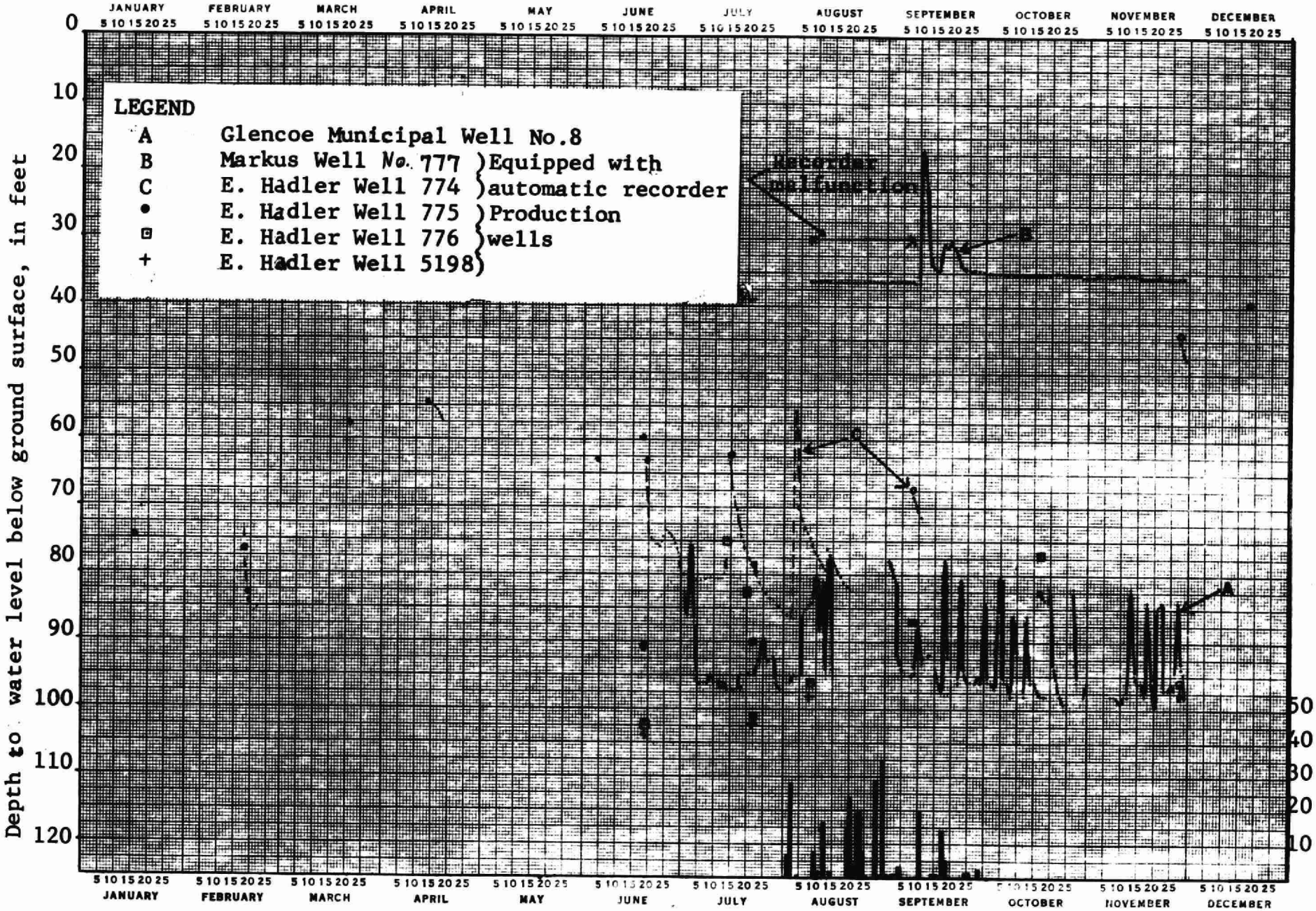
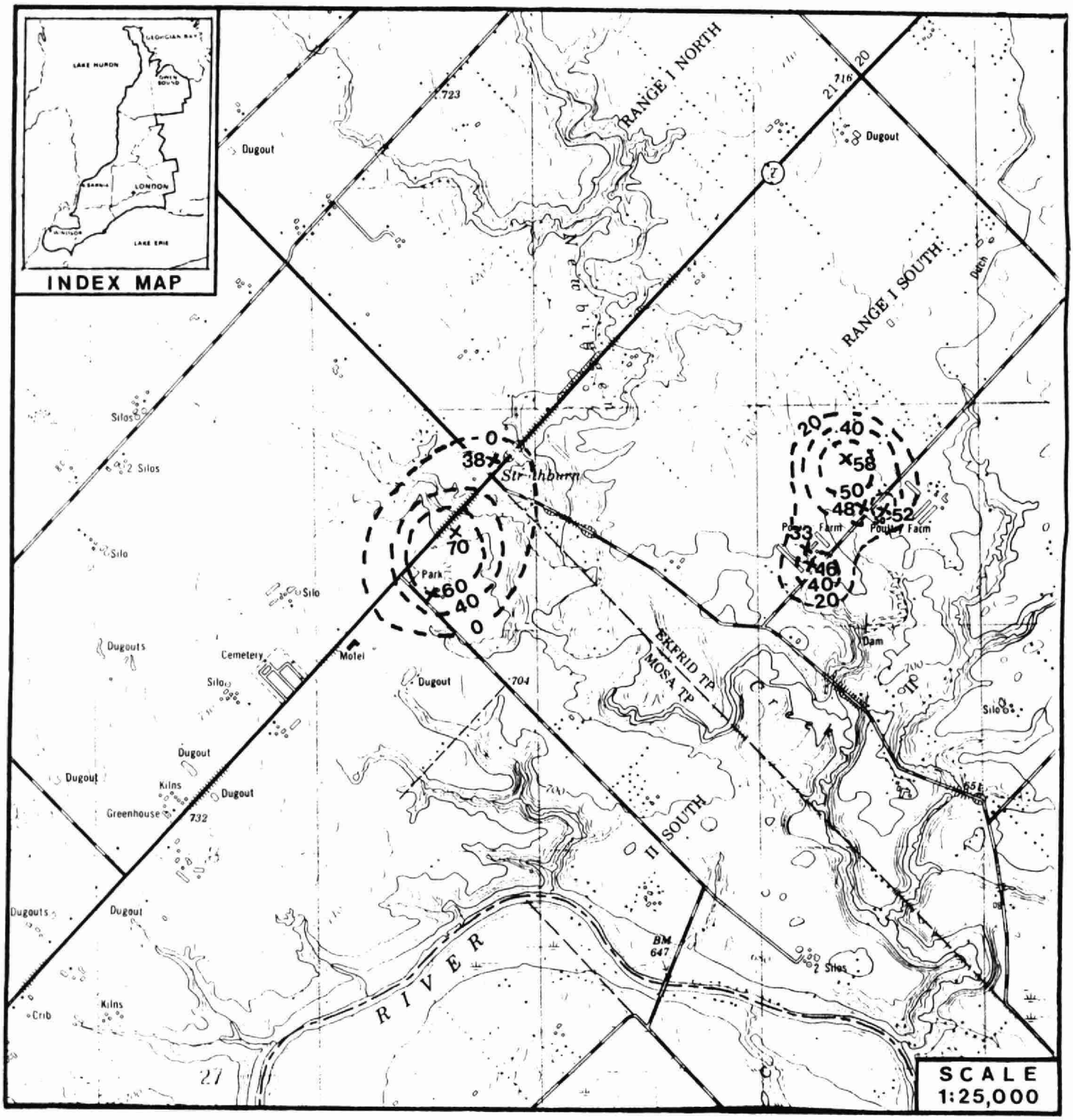


FIGURE 6. WATER LEVEL HYDROGRAPHS AND DEPTHS TO WATER LEVEL.

For the same time period, the water level in well No. 777 remained essentially the same except for the period between September 11 and 24, 1975 (Figure 6). On September 11, the water level in this well suddenly fluctuated from a stable level of 34 feet to within 17 feet below ground surface. This erratic behavior of the water level continued until September 24, 1975, when relative stabilization was regained.

DISCUSSION

The erratic behaviour of the water level in well No. 777 may have been caused by (a) direct surface water flow into the well, (b) accelerated aquifer recharge from heavy rainfall or (c) an abrupt stop in production from one or more wells which interferes with this well. It seems unlikely that the two last factors were the cause of the water level rise. Thus the water level rise could be attributed to the direct surface water flow into the well. Glencoe municipal well No. 8 was in production on September 11, 1975, and had average daily groundwater withdrawals of about 20,000 gallons which is an average daily withdrawal for the month of September. Therefore, the possibility that municipal well No. 8 was interfering with well No. 777 is quite remote. There is no information available as to whether any Hadler well was in operation on September 11, 1975, or for how



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x 46 Control point with value of the composite hydraulic pressure drawdown in feet.

--40-- Line of equal composite hydraulic pressure drawdown in feet.

FIGURE 7. CONTOUR MAP OF THE COMPOSITE HYDRAULIC PRESSURE DRAWDOWN OF THE BURIED SAND AND GRAVEL AQUIFER SYSTEM AT THE HADLER TURKEY FARM INC., WELL FIELD (JUNE 19, 1975) AND AT GLENCOE MUNICIPAL WELL No.8. (JULY 22, 1975).

long. However, the possibility that there is hydraulic communication between the Hadler wells and well No. 777 is not excluded. Field observation showed that the rainfall was responsible for the sudden rise of the water level in well No. 777.

a) Although the Hadler wells, well No. 777 and Glencoe municipal well No. 8 are obtaining water from approximately the same depth and hydrogeological environment it is unlikely that the hydraulic communication exists between the Hadler well field, and municipal well No. 8. However, such possibility for well No. 777 and the Hadler wells does exist.

b) The estimated radius of influence around Glencoe municipal well No. 8 is at a substantial distance from well No. 777 let alone the Hadler well field (Figure 7).

c) Assuming that the lowering of water level in well No. 777 from its original static level to the present level of about 36 feet is caused by the pumpage of Glencoe municipal well No. 8 the projected drawdown distance curve is high above the original static level in any wells at the Hadler Turkey Farm Inc., well field (Figure 3). Thus, from the above discussion it is concluded that it is unlikely that the Hadler Turkey Farms Inc., well field was interfered with by the operation of Glencoe municipal well No. 8.

CONCLUSIONS

From the field investigations and analysed data it is concluded that:

1. Similar hydrogeological conditions prevail at the Hadler well field, well No. 777 and, Glencoe municipal well No. 8.
2. These wells all obtain water from essentially the same hydrogeological environment, which is sand and gravel deposits situated immediately above or near the bedrock surface.
3. It is considered that interference among the wells on the Hadler property existed long before Glencoe municipal well No. 8 was put into production. This is because of their proximity to one another and the fact that groundwater withdrawals exceed natural aquifer recharge.
4. Recharge to the buried sand and gravel aquifer at the Hadler well field appears to be from precipitation in the form of vertical leakage through relatively thick confining lacustrine clay deposits.
5. Severe mining of the buried sand and gravel aquifer system is apparent.
6. It is unlikely that the Hadler well field was interfered with by the operation of Glencoe municipal well No. 8.

7. The probability that a new well of higher yield will be found on the Hadler property is quite low.

RECOMMENDATIONS

With regard to the apparent water shortage at the Hadler Turkey Farm Inc., it is recommended that:

1. If the groundwater continues to be the only source of water supply for this establishment, then the number of birds should be drastically reduced according to the available water supply and pumpage rendered to a point where hydraulic equilibrium is achieved. This means that the average pumping rate will be the quotient of the average groundwater recharge. Otherwise, it is considered that the aquifer system will be essentially depleted before long. In this regard, it is recommended that the present water supply system be improved by equipping each production well with a flowmeter and an airline. This will enable the operator to record water consumption and corresponding pumping water levels in production wells. Construction of water storage facilities would be advantageous because during a peak water demand production wells may not be overpumped.

2. If the number of birds stays the same or is increased then additional and new sources of water must be sought. The alternatives appear to be:

a) Surface water obtained by ponding of the local stream and the creation of an artificial lake. Difficulties may be experienced with regard to nutrient levels in such a lake.

b) Rainfall may be utilized by directing runoff to cisterns. Catchment areas could include building roofs, paved areas, or specially constructed surfaces covered with plastic or other impervious material. Catchments should be placed in areas where they will have a minimal effect on recharge to the aquifer system which is being pumped.

c) Artificial recharge by means of a recharge well. During winter and early spring months, water from the local stream could be directed into one or more recharge wells. Rainfall could be similarly recharged, however this Ministry would have a continuing concern that water of suitable chemical and bacterial quality was being introduced to the aquifer.

Continuous monitoring of the water level in well No. 777 equipped with automatic water level recorder will continue. Periodic measurement of water levels in other

wells in the area will also be carried out. If any new developments arise from this continuing investigation the parties involved will be informed.

REFERENCES

Chapman, L. J. and Putnam, D. F.

1966: The Physiography of Southern Ontario; Ontario Research Foundation, second edition.

Morrison, W. D.

1971: Report on an Ontario Water Resources Commission test drilling project at the Village of Glencoe. Hydrology Consultants Limited, Mississauga, Ontario.

APPENDIX A

SUMMARY OF WATER WELL RECORDS

SUMMARY OF WATER WELL RECORDS

COUNTY: MIDDLESEX TOWNSHIP(S): EKFRID DATE COMPILED: DEC '75 COMPILER: K. LYON

WELL NO.	LOCATION			ELEV. (FT.)	OWNER	DRILLER	DATE DRILLED	WELL TYPE	WELL DIA. (IN.)	WELL DEPTH (FT.)	WATER FOUND (FT.)	STATIC LEVEL (FT.)	PUMPING TEST			WATER TYPE	LOG AND REMARKS
	TWP.	LOT	CON.										DRAW-DOWN (FT.)	G.P.M.	HRS.		
663		23	GORE	700	GLENCOE PUC	R. DOLPHIN & T. EARL	08/64	O	7	121	114	19	13	30	24	FRESH	yellow clay 15, blue clay 75, hardpan 114, gravel 121
664		24	GORE	715	GLENCOE PUC	R. DOLPHIN & T. EARL	08/64	O	7	110	105	26	10	30	40	FRESH	yellow clay 15, blue clay 70, hardpan 105, gravel 110
5234		24	RANGE I NORTH	705	L. CAMPBELL	S. EARL	10/70	9	4	176	DRY	—	—	—	—	—	sand 7, blue clay 143, hardpan with stones 151, black shale 156, grey shale 176
5235		24	RANGE I NORTH	700	L. CAMPBELL	S. EARL	10/70	9	4	214	DRY	—	—	—	—	—	sand 5, blue clay 140, hardpan with stones 150, grey shale 214
5236		24	RANGE I NORTH	705	L. CAMPBELL	S. EARL	10/70	9	4	167	150	49	101	1/6	12	FRESH	sand 6, blue clay 139, hardpan with stones 150, grey shale 167
5161		24	RANGE I NORTH	710	L. CAMPBELL	S. EARL	07/70	9	4	168	139	45	55	3/4	10	FRESH	sand 5, blue clay 134, gravel with sand 139, hardpan with stones 146, black shale 168
5162		24	RANGE I NORTH	710	L. CAMPBELL	S. EARL	07/70	9	6	173	DRY	—	—	—	—	—	sand 7, blue clay 137, hardpan with stones 154, black shale with grey shale 173
5561		22	RANGE I NORTH	702	R. MCKENZIE (OWRC contract)	CORALTA DRILLING	06/71	9	?	148	?	12	—	INSUFFICIENT SUPPLY	—	?	grey clay 24, red clay 25, blue clay 51, blue sandy clay 52, grey clay 110, blue clay with gravel 119, gravel 120, grey clay with gravel 125, grey clay gravel 129, gravel 137, grey clay 138, green shale 148
5328		24	RANGE I NORTH	705	F. ALEXY	W. MARSH	01/71	O	5	123	119	43	7	4	12	FRESH	sand 2, brown clay 10, grey clay with stones 119, sand and gravel 123
5554		24	RANGE I SOUTH	705	P. MARCUS (OWRC contract)	CORALTA DRILLING	07/71	O	5	139	137	19	—	INSUFFICIENT SUPPLY	—	—	grey clay 103, grey clay with gravel 105, grey clay 107, grey clay with gravel 111, grey clay 118, boulder 120, grey clay with stones 125, boulder 126, grey clay 129, boulder 129, grey clay with shale boulders 137, gravel 139
777		24	RANGE I SOUTH	698	P. MARKUS	WELLINGTON NEWPORT	08/61	O	4	130	121	21	109	1/2	148	FRESH	blue clay 121, fine sand & gravel 130

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WELL NO.	LOCATION			ELEV. (FT.)	OWNER	DRILLER	DATE DRILLED	WELL TYPE	WELL DIA. (IN.)	WELL DEPTH (FT.)	WATER FOUND (FT.)	STATIC LEVEL (FT.)	PUMPING TEST			WATER TYPE	LOG AND REMARKS
	TWP.	LOT	CON.										DRAWDOWN (FT.)	G.P.M.	HRS.		
773		23	RANGE I SOUTH	698	A. McRAE	A. HEAL	06/57	o	4	114	112	60	20	2½	8	FRESH	yellow clay 30, blue clay 105, hardpan (mostly clay) 112, gravel & sand 113½, hardpan 114
774		23	RANGE I SOUTH	698	A. McRAE	A. HEAL	06/61	o	4	121	111	43	14	8	12	FRESH	yellow top soil 30, blue clay 102, gravel 103, gravelly clay 111, coarse sand 121
775		23	RANGE I SOUTH	695	E. HADLER	W. DALE	07/65	o	7	120	113	62	16	20	8	FRESH	brown clay 8, yellow clay 32, blue clay 72, blue clay & small stones 78, blue clay 110, cemented gravel 113, gravel 118, clay & gravel 120
5199		23	RANGE I SOUTH	705	E. HADLER	W. DALE	08/70	o?	7	155	DRY	—	—	—	—	—	top soil 1, brown clay 11, grey clay 19, blue clay 83, soft blue clay with gravel 106, blue clay with gravel 151, blue clay with shale 155
776		23	RANGE I SOUTH	700	E. HADLER	W. DALE	10/67	o	7	139	134	54	15	23	6	FRESH	brown clay 18, blue clay 58, grey clay 118, grey clay and gravel 134, gravel 139
5198		22	RANGE I SOUTH	705	E. HADLER	W. DALE	08/70	o?	7	141	125	72	19	22	8	FRESH	top soil 1, brown clay 23, grey clay 32, blue clay 71, blue clay with gravel 123, sand with gravel 135½, cemented gravel 136½, gravel with sand 138, blue clay with shale 141
5559		22	RANGE I SOUTH	705	E. HADLER (COWRC contract)	CORALTA DRILLING	06/71	?	4	122	?	17	—	INSUFFICIENT SUPPLY	—	?	brown clay 12, grey clay 60, gravel 61, grey clay 92, grey clay with gravel 95, grey clay 111, limestone boulder 114, green shale 122
780		23	RANGE II SOUTH	675	E. HADLER	W. DALE	10/67	?	7	345	DRY	—	—	—	—	—	brown clay 11, grey clay 24, blue clay 105, grey clay & gravel 121, gravel & clay 126, hardpan 130, shale 154, limestone 157, soft grey shale 338, hard limestone shale 345
781		24	RANGE II SOUTH	675	M. LOESCHEL	HADCO WELL DRILLING	02/62	o	30	32	13	12	20	4	½	FRESH	top soil 1, brown sand 11, fine gravel 13, blue clay 32

SUMMARY OF WATER WELL RECORDS

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WELL NO.	LOCATION			ELEV. (FT.)	OWNER	DRILLER	DATE DRILLED	WELL* TYPE	WELL DIA. (IN.)	WELL DEPTH (FT.)	WATER FOUND (FT.)	STATIC LEVEL (FT.)	PUMPING TEST			WATER TYPE	LOG AND REMARKS
	TWP.	LOT	CON.										DRAW-DOWN (FT.)	G.P.M.	HRS.		
2718		1	RANGE II NORTH	720	G. INNES	D. WILLITS	09/63	♀	4	188	156, 185	27	63	3	3	FRESH	surface sand 5, blue clay 85, hard pan 128, boulders & gravel 144, hardpan & shale 156, soft shale 184, hard grey rock 187, soapstone 187
2719		2	RANGE II NORTH	725	F. M'NAUGHTON	T. EARL	10/63	o	4	133	126	32	68	2	3	FRESH	blue clay 126, hard gravel 133
2704		2	RANGE I NORTH	725	R. SIMPSON	R. WILLITS	09/62	o	5	154	146	32	63	10†	2	FRESH	soil, sand & gravel 10, sand & clay streaks 16, clay & hardpan streaks 134, sand & hard pan 146, sand & fine gravel 150, coarser gravel 154
2707		3	RANGE I	725	M. CAMERON	R. WILLITS	05/62	o	5	162	135, 155, 162	44	116	10	4	FRESH	top sand, some stones 8, clay 42, hard pan 52, clay & stones 67, hardpan mild & some clay 135, sand & fine gravel 154, clay & small stone 155, sand & fine gravel 160, sand & gravel 162
2701		2	RANGE I NORTH	720	D. McRAE	D. HAYDEN	11/53	♀	4	225	223	20	203	WOULD SUPPLY 3 GPM	—	SALTY (WELL ABANDONED)	fine sand 22, blue clay 96, silty sand 143, dry gravel 145, hardpan & stones 160, soapstone rock 225
2702		2	RANGE I NORTH	720	D. McRAE	D. HAYDEN	11/53	♀	4	165	DRY	—	—	—	—	—	fine sand 20, blue clay 143, hardpan 145, dry gravel 157, lime rock 162, soapstone rock 165
2703		2	RANGE I NORTH	720	D. McRAE	D. HAYDEN	12/53	o	4	140	140	20	120	WOULD SUPPLY 1 GPM	—	FRESH	yellow sand 22, blue clay 137, hardpan 139, gravel 140
2706		2	RANGE I NORTH	725	W. HAILSTONE	R. WILLITS	11/62	o	5	176	163, 166	48	112	7	8	FRESH	surface sand 8, clay 9, sand & clay 29, clay & some hardpan 163, clay, sand, gravel & hardpan 166, clay & hardpan 176
2705		2	RANGE I NORTH	720	W. HAILSTONE	R. WILLITS	11/62	♀	5	255	143, 158, 207	48	—	—	—	FRESH	surface sand 12, clay 13, sand 23, sand & clay 36, clay & some hardpan 143, clay, sand & hardpan streaks 207, clay & stone 209, soft grey shale 238, soap 250, shale 252, soap 255
5557		1	RANGE I SOUTH	705	MINISTRY OF ENVIRONMENT	CORALTA DRILLING	07/71	♀	6	220	127	25	85	45	5	FRESH	brown clay 5, grey clay 12, gravel 13, grey clay 47, green clay (sticky) 77, gravel 78, sticky green clay 101, gravel 103, boulder 104, green clay 105, boulder 108, gravel seam with clay 118, stiff brown sand 128, course gravel 136, course sand 137, gravel 146, sticky green clay 194, green shale 197, green clay 213, shale 217, green clay 220

* ♀ Well drilled into bedrock o Well drilled in overburden

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COUNTY: MIDDLESEX TOWNSHIP(S): MOSA DATE COMPILED: DEC '75 COMPILER: K. LYON

WELL NO.	LOCATION			ELEV. (FT.)	OWNER	DRILLER	DATE DRILLED	WELL* TYPE	WELL DIA. (IN.)	WELL DEPTH (FT.)	WATER FOUND (FT.)	STATIC LEVEL (FT.)	PUMPING TEST			WATER TYPE	LOG AND REMARKS
	TWP.	LOT	CON.										DRAW-DOWN (FT.)	G.P.M.	HRS.		
5555		1	RANGE I SOUTH	705	MINISTRY OF ENVIRONMENT	CORALTA DRILLING	07/71	9	5	196	?	27	—	INSUF-FICIENT SUPPLY	—	?	blue clay 98, boulder 100, blue clay 104, gravel 109, coarse sand & gravel 116, gravel 123, blue clay 132, gravel 133, blue clay with gravel seams 137, gravel 139, blue clay 191, green shale 196
5556		1	RANGE I SOUTH	705	M. LITTLE (OWRC contract)	CORALTA DRILLING	07/71	9	5	240	?	26	—	INSUF-FICIENT SUPPLY	—	?	grey clay 31, boulder 32, grey clay 101, boulder 105, grey clay 108, grey clay & gravel seams 117, gravel & coarse sand 122, fine gravel 129, coarse gravel 138 fine gravel 142, coarse gravel 146, grey clay 236, limestone 240
2724		1	RANGE I SOUTH	700	MINISTRY OF TRANSPORTATION	R McGAFFEY	12/52	0	3 5/8	136	133	20	0?	?	?	FRESH	top clay 3, blue clay 119, boulder 119, hardpan 133, gravel 136
2740		1	RANGE I SOUTH	700	C. DYMOCK	HADCO WELL DRILLING	02/62	0	30	49	9	10	38	3	1/2	FRESH	top soil 1, brown clay 7, sand 9, blue clay 49
5551		3	RANGE I SOUTH	725	E. WITHLOCK (OWRC contract)	CORALTA DRILLING	07/71	9	5	162	6	6	—	INSUF-FICIENT SUPPLY	—	FRESH	sand 22, grey clay 131, fine gravel 132, grey clay 133, fine gravel 134, soft grey shale 150, green shale 158, limestone 162
5560		1	RANGE I SOUTH	705	M. LITTLE (OWRC contract)	CORALTA DRILLING	08/71	9	2	179	153	70 1/2	9 1/2	2	1	FRESH	brown clay 12, grey clay 124, boulder 126, grey clay 127, boulder 129, grey sandy clay 145, rock 146, grey sandy clay 153, gravel 155, gravel & blue clay 157 sandy blue clay 163, boulder 165, blue clay 179, rock 179
5553		4	RANGE I SOUTH	726	S. SIMPSON (OWRC contract)	CORALTA DRILLING	07/71	9	5	182	17	7 1/2	—	INSUF-FICIENT SUPPLY	—	FRESH	very fine sand 16, grey clay 17, fine sand 24, grey clay 28, quicksand 30, sticky grey clay 128, grey clay mixed with stones 130, grey clay 162, grey clay with small gravel seams 168, shale 182
5550		3	RANGE I SOUTH	708	E. WITHLOCK (OWRC contract)	CORALTA DRILLING	07/71	9	5	138	DRY	—	—	—	—	—	brown clay 20, grey clay 108, boulder 109, grey clay 116, boulder 117, grey clay 132, fine gravel 133, limestone 138
5558		2	RANGE II SOUTH	620	C. DYMOCK (OWRC contract)	CORALTA DRILLING	06/71	9	4	146	DRY	—	—	—	—	—	brown clay 14, blue clay 38, green clay 43, gravel 44, grey clay 70, boulder 71, clay sandy with rocks 76, gravel 77, grey clay sandy with gravel 91, gravel with sand, grey clay 98, gravel with sand 103, grey clay with small gravel seams 114, gravel with sand 115, grey clay 129, gravel 130, grey clay 131, gravel with sandy clay seams 135, gravel with clay 140, grey clay 141, green shale 146

* 9 Well drilled into bedrock o Well drilled in overburden

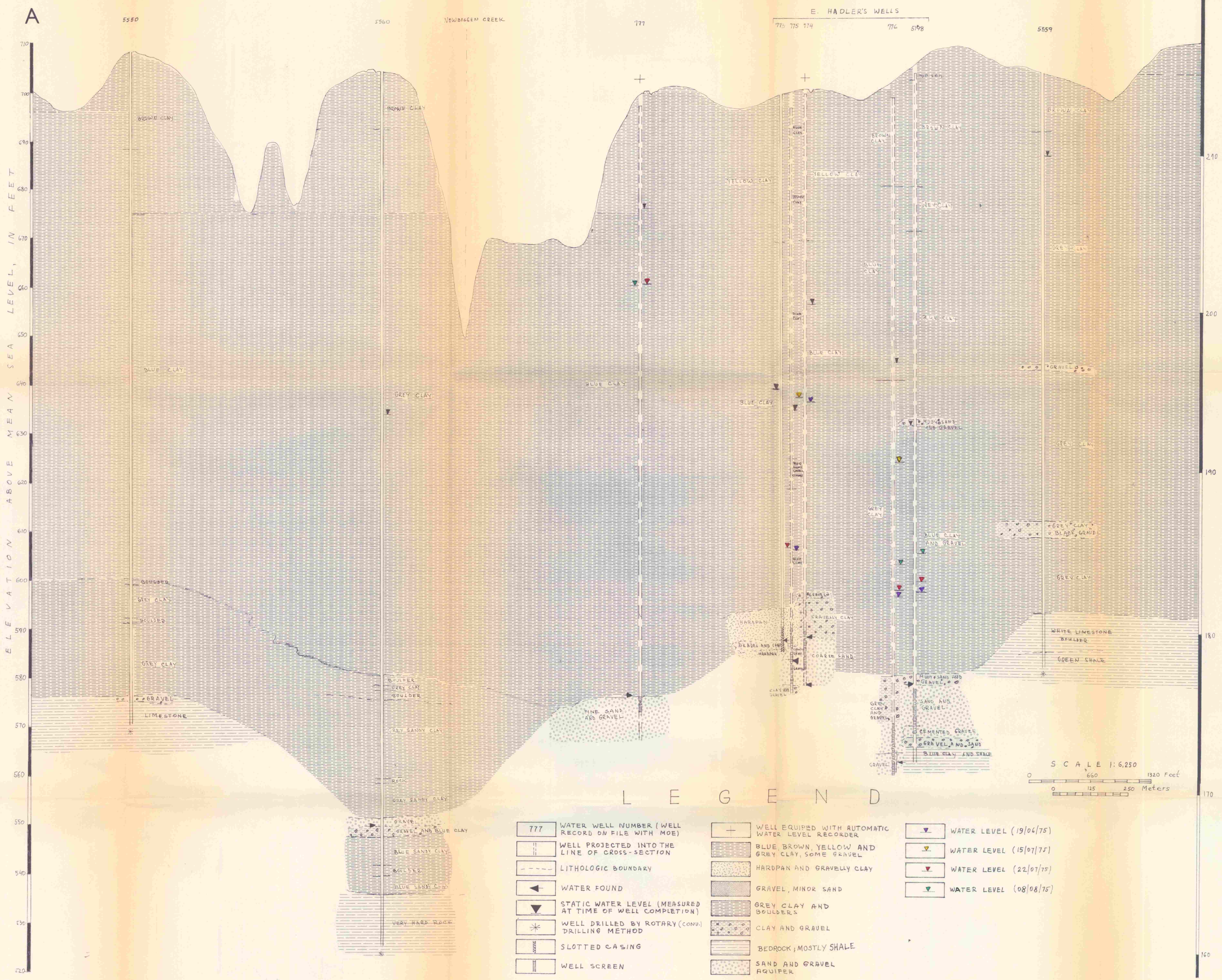

FIGURE 2. GEOLOGICAL CROSS SECTION A—A' SHOWING VARIATION OF HYDROGEOLOGICAL ENVIRONMENTS AT THE HADLER TURKEY FARM.

B 2707 — 2701 — 5557 — NEWBIGGEN CREEK — 777 — E. HADLER'S WELLS 773 774 775 780 — B'

GLENCOE PRODUCTION WELL #8

ELEVATION ABOVE MEAN SEA LEVEL, IN FEET

730 720 700 680 660 640 620 600 580 560 540 520 500 480

SAND, SOME STONES
CLAY
HARDPAN
CLAY AND STONES
HARDPAN, SOME CLAY
SAND AND FINE GRAVEL
CLAY, SMALL STONES
SAND AND FINE GRAVEL
SAND AND GRAVEL
FINE SAND
BLUE CLAY
SILTY SAND
DRY GRAVEL
HARDPAN AND STONES
SOAPSTONE ROCK
(SALTY WATER)
BROWN CLAY
GREY CLAY
BLACK GRAVEL
GREY CLAY
GREEN CLAY
GRAVEL
GREEN CLAY
GRAVEL BOULDERS GREEN CLAY BOULDER
GREEN CLAY AND GRAVEL SMALL GRAVEL SEAMS WITH CLAY
FINE BROWN SAND
COARSE GRAVEL
COARSE SAND
COARSE GRAVEL
GREEN CLAY
GREEN SHALE
SHALE
GREEN CLAY
BLUE CLAY
BLUE CLAY
YELLOW CLAY
BROWN CLAY
YELLOW CLAY
BLUE CLAY, SMALL STONES
BLUE CLAY
HARDPAN
GRAVEL AND SAND HARDPAN
FINE SAND AND GRAVEL
BROWN CLAY
GREY CLAY
BLUE CLAY
GREY CLAY AND GRAVEL
GRAVEL AND CLAY
HARDPAN
SHALE
LIMESTONE
SOFT GREY SHALE
558' SHALE 345'

ELEVATION ABOVE MEAN SEA LEVEL, IN METERS

223 220 210 200 190 180 170 160 150 146

LEGEND

- WATER LEVEL (19/06/75)
- WATER LEVEL (15/07/75)
- WATER LEVEL (22/07/75)
- WATER LEVEL (08/08/75)

L E G E N D

- 773 — WATER WELL NUMBER (WELL RECORD ON FILE WITH MOE)
- LITHOLOGIC BOUNDARY
- DEPTH WATER FOUND
- STATIC WATER LEVEL (MEASURED AT TIME OF WELL COMPLETION)
- WELL PROJECTED INTO THE LINE OF CROSS-SECTION
- WELL SCREEN
- SLOTTED CASING
- SAND, FINE SAND SOME STONES
- BLUE, BROWN, YELLOW, GREEN AND GREY CLAY
- HARDPAN, SOME CLAY AND STONES
- CLAY, SOME STONES
- SAND, GRAVEL, SILTY SAND, SOME BOULDERS
- GREY CLAY AND GRAVEL
- BEDROCK, MOSTLY SHALE
- SAND AND GRAVEL AQUIFER
- WELL EQUIPED WITH AUTOMATIC WATER LEVEL RECORDER

0 500 1000 1500 Feet
0 100 200 300 Meters

FIGURE 3. GEOLOGICAL CROSS SECTION B–B' SHOWING VARIATION OF HYDROGEOLOGICAL ENVIRONMENTS AT GLENCOE MUNICIPAL WELL No. 8 AND THE HADLER TURKEY FARM.

Date Due
